What is claimed is:

1. A lighting optical machine comprising:

a housing, wherein the housing accommodates a laser source, a beam polarization mechanism having first and second plane mirrors enabling a beam emitted from the laser source to be reflected so that the beam travels in the direction almost parallel to the beam emitted from the laser source, a beam expander for converting the beam to a parallel beam having a larger cross-sectional area, and an objective lens, through which the parallel beam is reduced and applied to the surface of a sample;

a first control mechanism for controlling the directions of the two plane mirrors of the beam polarization mechanism with an electric signal; and

a second control mechanism for controlling the focus position of the beam expander with an electric signal.

2. The lighting optical machine according to claim 1, wherein the housing further accommodates a first beam splitter for amplitude-splitting the parallel beam in the light passage from the beam expander to the objective lens, a second beam splitter for further dividing in two the parallel beam reflected by the first beam splitter, a beam profile observation camera for observing the beam intensity profile of the cross-section of one of the divided parallel beams, a convergence lens for converging the other divided parallel beam, and a beam spot positioning sensor for detecting the position of a spot image converged with the convergence lens, and

the lighting optical machine further comprising display means, provided outside the housing, for displaying output signals from either one of or both the beam profile observation camera and beam spot positioning sensor.

3. A defect inspection system comprising:

a housing, wherein the housing accommodates a laser source, a beam polarization mechanism having first and second plane mirrors enabling a beam emitted from the laser source to be reflected so that the beam travels in the direction almost parallel to the beam emitted from the laser source, a beam expander for converting the beam to a parallel beam having a larger cross-sectional area, an objective lens, through which the parallel beam is reduced and applied to the surface of a sample, a first beam splitter for amplitude-splitting the parallel beam in the light passage from beam expander to the objective lens, a second beam splitter for further dividing in two the parallel beam reflected by the first beam splitter, a beam profile observation camera for observing the beam intensity profile of the cross-section of a first parallel beam, one of the divided beams, a convergence lens for converging a second parallel beam, the other of the divided beams, and a beam spot positioning sensor for detecting the position of a spot image converged with the convergence lens;

display means for displaying output signals of either one of or both the beam profile observation camera and beam spot positioning sensor;

a first control mechanism for controlling the directions of the two plane mirrors of the beam polarization mechanism with an electric signal;

a second control mechanism for controlling the focus position of the beam expander with an electric signal;

an optical image observation mechanism for forming an enlarged image of the sample irradiated with the second parallel beam; and

an image comparison mechanism for comparing images of two areas on the sample obtained by the optical image observation mechanism to detect a defect.

4. A lighting optical machine comprising:

a housing, wherein the housing accommodates a laser source, a first plane mirror for reflecting a beam emitted from the laser source to the direction approximately

perpendicular to the traveling direction of the beam, a second plane mirror for reflecting again the beam reflected by the first plane mirror to the direction approximately perpendicular to the traveling direction of the reflected beam to generate the beam traveling in the direction approximately parallel to the beam emitted from the laser source, a beam expander for converting the beam to a parallel beam having a larger cross-sectional area, and an objective lens, through which the parallel beam is reduced and applied to the surface of a sample;

a first control mechanism for controlling the directions of the first and second plane mirrors of the beam polarization mechanism with an electric signal; and

a second control mechanism for controlling the focus position of the beam expander with an electric signal.

5. The lighting optical machine according to claim 4, wherein the housing further accommodates a first beam splitter for amplitude-splitting the parallel beam in the light passage from the beam expander to the objective lens, a second beam splitter for further dividing in two the parallel beam reflected by the first beam splitter, a beam profile observation camera for observing the beam intensity profile of the cross-section of one parallel beam of the divided beams, a lens for converging the other parallel beam of the divided beams, and a beam spot positioning sensor for detecting the position of a spot image converged with the lens,

the lighting optical machine further comprising display means for displaying output signals of either one of or both the beam profile observation camera and beam spot positioning sensor.

6. A defect inspection system comprising:

a housing, wherein the housing accommodates a laser source, a first plane mirror for reflecting a beam emitted from the laser source to the direction approximately

perpendicular to the traveling direction of the beam, a second plane mirror for reflecting again the beam reflected by the first plane mirror to the direction approximately perpendicular to the traveling direction of the reflected beam to generate the beam traveling in the direction approximately parallel to the beam emitted from the laser source, a beam expander for converting the beam to a parallel beam having a larger cross-section area, an objective lens, through which the parallel beam is reduced and applied to the surface of a sample, a first beam splitter for amplitude-splitting the parallel beam in the light passage from the beam expander to the objective lens, a second beam splitter for further dividing in two the parallel beam reflected by the first beam splitter, a beam profile observation camera for observing the beam intensity profile of the cross-section of a first parallel beam, one of the divided beams, a convergence lens for converging a second parallel beam, the other of the divided beams, and a beam spot positioning sensor for detecting the position of a spot image converged with the convergence lens;

display means for displaying output signals of either one of or both the beam profile observation camera and beam spot positioning sensor;

a first control mechanism for controlling the directions of the two plane mirrors of the beam polarization mechanism with an electric signal;

a second control mechanism for controlling the focus position of the beam expander with an electric signal;

an optical image observation mechanism for forming an enlarged image of the sample irradiated with the second parallel beam; and

an image comparison mechanism for comparing images of two areas on the sample obtained by the optical image observation mechanism to detect a defect.